

Amendment to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (previously presented) An authentication system comprising:
 - a mobile storage device; and
 - a reader/writer for performing at least one of reading information from and writing information into said mobile storage device,
 - wherein said reader/writer comprises:
 - a biological information input device which inputs fingerprint information,
 - preprocessing means which calculates coordinates and curvatures for a plurality of candidate points of the fingerprint information inputted by the biological information input device, calculates an average value of the coordinates for the plurality of candidate points, and determines a core position by the average value of the coordinates for the plurality of candidate points;
 - a transmitting means for transmitting the core position generated in the preprocessing means to said mobile storage device according to a request from said mobile storage device,
 - wherein said mobile storage device comprises:
 - a template which registers a plurality of coordinates of featuring points of the fingerprint and ~~small~~partial images in ~~vicinity~~a vicinity of the coordinates;

a private key to be used for electronic authentication,
calculating means for calculating an information for correcting a positional
displacement based on a core position of a registered fingerprint recorded in said
template and a core position of an input fingerprint that is newly inputted, by referring
to said core position generated in the reader/writer;

requesting means for calculating coordinates of featuring points of the input
fingerprint by calculating information for correcting the positional displacement with
each of the coordinates of featuring points and requests fingerprint images in the
vicinity of the coordinates of featuring points of the inputted fingerprint from the
reader/writer;

judging means for judging whether the small-partial images in the vicinity of
the coordinates of the fingerprint registered in the template and the small-partial
images in the vicinity of the coordinates of featuring points of the inputted fingerprint
match, and in accordance with a plurality of results of the matchinga matching result,
judges whether the fingerprint registered in the template and the input fingerprint are
identical; and

means for making the private key available when the result of judging
fingerprints are identicalidentical,

wherein the transmitting means of the reader/writer comprises, for each partial
image:

means for extracting from the input fingerprint a partial image requested by
the requesting means of the mobile storage device, means for transmitting the

extracted partial image to the mobile storage device, and means for repeatedly extracting and transmitting each of the partial images one by one until a satisfactory level of matching is achieved, and

wherein the judging means of the mobile storage device comprises:
means for repeating the matching result for each partial image.

2.- 4. (canceled)

5. (currently amended) An authentication system according to claim 1, wherein said reader/writer further comprises:

calculating means for calculating information for correcting a positional displacement between a registered fingerprint in said template and an input fingerprint that is newly input by forming images having specific luminance distributions in the peripheries of individual featuring points with regard to the input fingerprint and the registered fingerprint, and by correlating said images therebetween,

retrieving means for retrieving a small-partial image in the vicinity of a featuring point of said registered fingerprint by matching in the vicinity of coordinates for an image of said inputted fingerprint, wherein the positional displacement of the coordinates has been corrected, and judging means for judging whether or not said fingerprint image is identical to said template according to the number of matched said small-partial images.

6. (previously presented) An authentication system according to Claim 1, wherein the calculation means for calculating an information for correcting a positional displacement based on a core position calculates other candidate points of the fingerprint information by calculating a coordinate of the candidate point of an initial position and a normal vector of ridge at the initial position of the candidate point.

7. (currently amended) An authentication system according to Claim 1, wherein the preprocessing means invalidates the candidate points having no more than a threshold value of curvature, and determines the core position by averaging the coordinates for the candidate points left overhaving more than a threshold value of curvature.

8. (previously presented) An authentication system according to Claim 1, wherein the judging means judges identity of the fingerprint registered in the template and the input fingerprint, when a number of the match is no less than a threshold value.

9. (previously presented) An authentication system according to Claim 1, wherein the private key is used for authentication of applications in a computer being connected to the reader/writer.

10. (currently amended) A mobile storage device for authentication utilizing biometric information, the mobile storage device performing at least one of transferring read information to and receiving write information from a reader/writer, wherein the reader/writer comprises:

a biological information input device which inputs fingerprint information; preprocessing means which calculates coordinates and curvatures for a plurality of candidate points of the fingerprint information inputted by the biological information input device, calculates an average value of the coordinates for the plurality of candidate points, and determines a core position by the average value of the coordinates for the plurality of candidate points; and

transmitting means for transmitting the core position generated in the preprocessing means to said mobile storage device according to a request from said mobile storage device,

wherein said mobile storage device comprises:

a template which registers a plurality of coordinates of featuring points of the fingerprint and small partial images in vicinity a vicinity of the coordinates; a private key to be used for electronic authentication; calculating means for calculating an information for correcting a positional displacement based on a core position of a registered fingerprint recorded in said template and a core position of an input fingerprint that is newly inputted, by referring to each said core positions in the reader/writer;

requesting means for calculating coordinates of featuring points of the input fingerprint by calculating information for correcting the positional displacement with each of the coordinates of featuring points, and requests fingerprint images in the vicinity of the coordinates of featuring points of the inputted fingerprint to the reader/writer;

judging means for judging whether the small-partial images in vicinity of the coordinates of the fingerprint registered in the template and the small-partial images in the vicinity of the coordinates of featuring points of the inputted fingerprint match, and in accordance with a plurality of results of the matching, judges whether the fingerprint registered in the template and the input fingerprint are identical; and

means for making the private key available when the result of judging fingerprints are identical.

wherein the transmitting means of the reader/writer comprises, for each partial image:

means for extracting from the input fingerprint a partial image requested by the requesting means of the mobile storage device, means for transmitting the extracted partial image to the mobile storage device, and means for repeatedly extracting and transmitting each of the partial images one by one until a satisfactory level of matching is achieved, and

wherein the judging means of the mobile storage device comprises:
means for repeating the matching result for each partial image.

11. (new) A mobile storage device according to claim 10, wherein the mobile storage device is an integrated circuit (IC) card.

12. (new) An authentication system for authentications with biological information, comprising:

a reader/writer for performing the reading of information from and the writing of information into a mobile storage device; and

a terminal connected with said reader/writer,

wherein said reader/writer comprises:

a biological information input device which inputs fingerprint information;

preprocessing means which calculates coordinates and curvatures for a plurality of candidate points of the fingerprint information inputted by the biological information input device, calculates an average value of the coordinates for the plurality of candidate points and determines a core position by the average value of the coordinates for the plurality of candidate points and determines a core position by the average value of the coordinates for the plurality of candidate points; and

transmitting means for transmitting the core position generated in the preprocessing means to said mobile storage device according to a request from said mobile storage device,

wherein said mobile storage device comprises:

a template which registers a plurality of coordinates of featuring points of the fingerprint and partial images in the vicinity of the coordinates;

a private key to be used for electronic authentication;
calculating means for calculating information for correcting a positional displacement based on a core position of the fingerprint registered in said template and a core position of an input fingerprint that is newly inputted, by referring to said core position generated in the reader/writer;

requesting means for calculating coordinates of featuring points of the input fingerprint by calculating information for correcting the positional displacement with each of the coordinates of featuring points and for requesting partial images in the vicinity of the coordinates of featuring points of the inputted fingerprint to the reader/writer;

judging means for judging whether the partial images in the vicinity of the coordinates of the fingerprint registered in the template and the partial images in the vicinity of the coordinates of the featuring points of the inputted fingerprint match and in accordance with a matching result, and judging whether the fingerprint registered in the template and the input fingerprint are identical; and

means for making the private key available when the judging result of the fingerprints is identical,

wherein the transmitting means of the reader/writer comprises, for each partial image:

means for extracting from the input fingerprint a partial image requested by the requesting means of the mobile storage device, means for transmitting the extracted partial image to the mobile storage device, and means for repeatedly

extracting and transmitting each of the partial images one by one until a satisfactory level of matching is achieved, and

wherein the judging means of the mobile storage device comprises:

means for repeating the matching result for each partial image.

13. (new) An authentication system comprising: a mobile storage device of a user; and a reader/writer for performing the reading of information from and writing of information into said mobile storage device,

wherein said reader/writer comprises:

an interface for transmitting and receiving information to and from said mobile storage device;

an input device for accepting the input of the biological information of said user; and

a processing unit which performs a preprocessing on said biological information inputted through said input device, transmits a command for acquiring information to specify one partial image, extracts one partial image corresponding to the information coming from said mobile storage device for specifying said one partial image, from said preprocessed biological information, transmits said extracted one partial image, to said mobile storage device, and receives the collation result of said one partial image, from said mobile storage device;

wherein said mobile storage device comprises:

an interface for transmitting and receiving information to and from said reader/writer;

a storage device for storing a partial image of a biological information of said user registered in advance and the information for specifying said partial image; and

a processing unit which transmits, in response to said command from said reader/writer, the information for specifying said one partial image in said storage device, collates, in response to said one partial image from said reader/writer corresponding to the information for specifying said one partial image, said one partial image from said reader/writer and said one partial image in said storage device, and transmits said collation result to said reader/writer, and

wherein said processing unit of said reader/writer comprises:

means for repeatedly transmitting said command, extracting said one partial image, transmitting said extracted one partial image, and receiving the collation result of said one partial image, for each partial image, until the matching number of said partial images as a result of said collation exceeds a predetermined threshold value, and

wherein said processing unit of said mobile storage device comprises:

means for repeatedly transmitting the information for specifying said one partial image, collating said partial image, and transmitting said collation result, for each partial image.

14. (new) An authentication system according to Claim 13,
wherein said processing unit of said reader/writer detects, in said
preprocessing, the position of one portion having a featuring constitution in said
biological information, from said inputted biological information, and sends out the
detected one position to said mobile storage device,
wherein said storage device of said mobile storage device further stores the
position of one portion having the featuring constitution in said biological information,
and
wherein said processing unit of said mobile storage device calculates
correction information for correcting the displacement between the position of one
portion having a featuring constitution in said inputted biological information received
from said reader/writer and the position of one portion having a featuring constitution
in the biological information stored in said storage device, corrects the information for
specifying said partial image, with said correction information, and transmits the
corrected information to said reader/writer.

15. (new) An authentication system according to Claim 13,
wherein said processing unit of said reader/writer detects, in said
preprocessing, the coordinates of all featuring points of said inputted biological
information, and sends out the detected coordinates to said mobile storage device,
wherein said storage device of said mobile storage device further stores the
coordinates of the individual featuring points of said biological information, and

wherein said processing unit of said mobile storage device generates an inputted biological information featuring point map being an image having a specific brightness distribution in the periphery of coordinates of the individual featuring points, with the coordinates of all featuring points of said inputted biological information, generates the registered biological information featuring point map using the coordinates of the individual featuring points of the image data of the biological information stored in said storage device, calculates the correlations between said inputted biological information featuring point map and said registered biological information featuring point map, determines the positional displacement having the maximum correlation value calculated, as correction information, corrects the information for specifying said partial image, with said correction information, and transmits the corrected information to said reader/writer.

16. (new) An authentication system according to Claim 13,
wherein said storage device of said mobile storage device further stores the coordinates of the individual featuring points of said biological information, and
wherein said processing unit of said mobile storage device transmits the coordinates of the individual featuring points stored in said storage device to said reader/writer,
wherein said processing unit of said reader/writer detects, in said preprocessing, the coordinates of all featuring points of the image data of said inputted biological information, generates an inputted biological information featuring

point map being an image having specific brightness distribution in the periphery of the detected coordinates of the individual featuring points, generates the registered biological information featuring point map using the coordinates of the individual featuring points received from said mobile storage device, calculates the correlations between said the inputted biological information featuring point map and said registered biological information featuring point map, determines the positional displacement having the maximum correlation value calculated, as correction information, and transmits the correction information to said mobile storage device, and

wherein the processing unit of said mobile storage device corrects said partial image, with said received correction information, and transmits the corrected information.

17. (new) A mobile storage device capable of communicating with a reader/writer for receiving the input of biological information of a user, wherein said reader/writer comprises:

an interface for transmitting and receiving information to and from said mobile storage device;

an input device for accepting the input of the biological information of said user; and

a processing unit which performs a preprocessing on said biological information inputted through said input device, transmits a command for acquiring

information to specify one partial image, to said mobile storage device, extracts one partial image corresponding to the information coming from said mobile storage device for specifying said one partial image, from said preprocessed biological information, transmits said extracted one partial image to said mobile storage device, and receives a collation result of said one partial image, from said mobile storage device,

wherein said mobile storage device comprises:

an interface for transmitting said receiving information to and from said reader/writer;

a storage device for storing a partial image of the preregistered biological information of said user and information for specifying said partial image; and

a processing unit which transmits the information for specifying said one partial image in said storage device, to said reader/writer, in response to said command from said reader/writer, collates said one partial image from said reader/writer and said one partial image in said storage device, and transmits the collation result to said reader/writer, and

wherein said processing unit of said reader/writer comprises:

means for repeatedly transmitting said command, extracting said one partial image, transmitting said extracted one partial image, and receiving the collation result of said one partial image, for each partial image, until the matching number of said partial images as a result of said collation exceeds a predetermined threshold value, and

wherein said processing unit of said mobile storage device comprises:
means for repeatedly transmitting information for specifying said one partial
image in response to said command from said reader/writer, collating said partial
image in response to said one partial image from said reader/writer, and transmitting
said collation result, for each partial image.

18. (new) A mobile storage device according to Claim 17,
wherein said storage device of said mobile storage device further stores the
position of one portion having the featuring constitution in said biological information,
and

wherein said processing unit of said mobile storage device calculates, as said
preprocessing, correction information for correcting the displacement between the
position of one portion having a featuring constitution in said biological information,
which is detected and sent from said inputted biological information, and the position
of one portion having a featuring constitution in the biological information stored in
said storage device, corrects the information for specifying said partial image, with
said correction information, and transmits the corrected information to said
reader/writer.

19. (new) A mobile storage device according to Claim 17,
wherein said storage device of said mobile storage device further stores the
coordinates of the individual featuring points of said biological information, and

wherein said processing unit of said mobile storage device generates the inputted biological information featuring point map being an image having specific brightness distribution in the periphery of the coordinates of the individual featuring points, using the coordinates of all featuring points of said inputted biological information, which are detected and sent out by the processing unit of said reader/writer, generates the registered biological information featuring point map, using the coordinates of the individual featuring points of the biological information stored in said storage device, calculates the correlations between said inputted biological information featuring point map and said registered biological information featuring point map, determines the positional displacement having the maximum correlation value calculated, as correction information, corrects the information for specifying said partial image, with said correction information, and transmits the corrected information to said reader/writer.

20. (new) A mobile storage device according to Claim 17,
wherein said mobile storage device is an integrated circuit (IC) card.

21. (new) An authentication system for authentications with the biological

information of a user, comprising:

a reader/writer for performing the reading of information from and the writing of information into a mobile storage device of said user; and

a terminal connected with said reader/writer,

wherein said reader/writer comprises:

an interface for transmitting and receiving information to and from said mobile storage device;

an input device for accepting the input of the biological information; and

a processing unit which performs a preprocessing on said biological information inputted through said input device, transmits a command for acquiring information to specify one partial image, to said mobile storage device, extracts one partial image corresponding to the information coming from said mobile storage device for specifying said one partial image, from said preprocessed biological information, transmits said extracted one partial image to said mobile storage device, and receives the collation result of said one partial image, from said mobile storage device,

wherein said mobile storage device comprises:

an interface for transmitting and receiving information to and from said reader/writer;

a storage device for storing a partial image of preregistered biological information of said user and information for specifying said partial image; and

a processing unit which transmits, in response to said command from said reader/writer, the information for specifying said one partial image in said storage device, collates, in response to said one partial image from said reader/writer corresponding to the information for specifying said one partial image, said one

partial image from said reader/writer and said one partial image in said storage device, and transmits said collation result to said reader/writer, and

wherein said processing unit of said reader/writer comprises:

means for repeatedly transmitting said command, extracting said one partial image, transmitting said extracted one partial image, and receiving the collation result of said one partial image, for each partial image, until the matching number of said partial images as a result of said collation exceeds a predetermined threshold value, and

wherein said processing unit of said mobile storage device comprises:

means for repeatedly transmitting information for specifying said one partial image, collating said partial image, and transmitting said collation result, for each partial image.